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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/642,385	08/15/2003	Simon Raab	FAO-0140	9473
23413	7590	08/06/2004	EXAMINER REIS, TRAVIS M	
CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002			ART UNIT 2859	PAPER NUMBER

DATE MAILED: 08/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/642,385

Applicant(s)

RAAB ET AL.

Examiner

Travis M Reis

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration. /
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☒ Claim(s) 18, 19 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>20040113; 20040121</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Drawings

1. The drawings are objected to because in Figure 2, reference characters "259" and "260" should be switched; in Figures 3 & 6, reference character "42" should be ---41---. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "120" has been used to designate both ID chips in Figure 23A and sockets in Figures 7, 8, 24, 25, 26; reference character "196" has been used to designate both an internal channel in Figure 27B and a housing in Figure 29; reference character "292" has been used to designate both a bearing in Figures 32 & 33 and an opening in Figure 32. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 4, 19, 168, 401, 162, 164, 191, 209, 279, 400, 450, 505. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

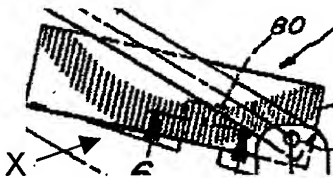
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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-7, 20, 21, 23, 24, 26, & 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Guertin et al. (U.S. Patent 5669150).

Guertin et al. discloses a portable coordinate measurement machine (10) for measuring the position of an object (11) in a selected volume comprising a manually positionable articulated arm (14) having opposed first (30) and second ends (45), said arm including a plurality of joints (29, 46, 56, 58) (Figures 1 & 2), wherein two of said joints (29) are threadably fastened to each other using threadable fasteners (Figure 2), a measurement probe (28) attached to a first end of said articulated arm (Figure 1), an electronic circuit (120) which receives the position signals from transducers in said arm and provides a digital coordinate corresponding to the position of the probe in a selected volume, and wherein at least one of said joints further comprise periodic optical fringe grating patterns (84) of a measurable characteristic on an rotatable encoder disk (X, see below),



and optical read heads (76, 80) including sensors (70, 72) in axial alignment and spaced apart approximately 90 degrees from each other, which measure relative movement displacement in said articulated arm with respect to said read head so as to improve the accuracy of the read head in an XY plane (col. 3 lines 3-5), bearings (54), and said pattern and said read heads being positioned within each said joint so as to be rotatable with respect to each other (Figure 8).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guertin et al.

Guertin et al. discloses all of the instant claimed invention as stated above in the rejection of claims 1-7, 20, 21, 23, 24, 26, & 30 do not disclose wherein the pattern is stationary with respect to said read heads and the read heads are rotatable with respect to said pattern. However, the use of the particular type of pattern and read head arrangement claimed by applicant, i.e., stationary pattern, rotating heads, absent any criticality, is considered to be nothing more than a choice of engineering skill, choice or design because 1) neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as rotation of the joints are sensed by the read heads, as already suggested by Guertin et al., 2) the pattern and read head arrangement claimed by Applicant and the pattern and read head arrangement used by Guertin et al. are well known alternate types pattern and read head arrangements which will

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perform the same function, if one is replaced with the other, of sensing the rotation of the joint by the read heads, and 3) the use of the particular type of pattern and read head arrangement by Applicant is considered to be nothing more than the use of one of numerous and well known alternate types of pattern and read head arrangements that a person having ordinary skill in the art would have been able to provide using routine experimentation in order to sensing the rotation of the joints by the read heads as already suggested by Guertin et al. Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention was made to keep the pattern stationary while rotating the read heads disclosed by Guertin et al. in order to easily access the pattern for maintenance.

9. Claims 8-17, 25, 32-34, 37 & 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guertin et al. in view of Eaton (U.S. Patent 5829146).

With reference to claims 8-12, 32-34, & 37, Guertin et al. disclose all of the instant claimed invention as stated above in the rejection of claims 1-7, 20, 21, 23, 24, 26, & 30 but do not disclose a first and second housing, and a rotatable shaft extending from said second housing into said first housing, and a preloaded bearing comprising a first and second bearing, with inner and outer spacer sleeves of different lengths between and compressed against said bearings, said bearing disposed between said shaft and first housing permitting said rotatable shaft to rotate within the first housing, the pattern attached directly to the shaft.

Eaton discloses a spatial measuring device including a first (7e) and second housing (5), and a rotatable shaft (205) extending from said second housing into said first housing (Figure 2), and a preloaded bearing comprising a first (32) and second bearing/slip ring (15), with inner (42) and outer (45) spacer sleeves of different lengths between and compressed against said bearings, said bearing disposed between said shaft and first housing permitting said rotatable shaft to rotate within said first housing, said pattern attached directly to said

shaft (Figure 1). Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention was made to add the housings, rotatable shaft, and bearings disclosed by Eaton to the arm disclosed by Guertin et al. & Brenner et al. in order to increase the degrees of freedom of the machine in a stable manner.

With reference to claims 13-17, 25, & 38, Guertin et al. discloses a coordinate calculator (128) which serves as a sensor to measure Z-axis displacement (col. 9 lines 7-9).

Guertin et al. do not disclose a plurality of sensors or read heads for measuring the rotation of the X, Y, & Z axes or said read head detect the interference between diffraction orders to produce sinusoidal signals from said read head inserted in said fringe pattern, said sinusoidal signals being electronically interpolated to detect displacement.

Eaton discloses optical sensors within transducers for measuring the rotation of the joints incorporated into the joints utilizing sinusoidal signals produced from diffraction orders in a fringe pattern which are electronically interpolated in order to maximize precision is common in the prior art (col. 1 lines 51-66). Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention was made to add the transducers with optical sinusoidal signal generating sensors disclosed by Eaton to the joints disclosed by Guertin et al. in order to maximize precision & in order to generate accurate sinusoidal signals to determine displacement.

10. Claims 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guertin et al. in view of Raab (U.S. Patent 5611147).

Guertin et al. disclose all of the instant claimed invention as stated above in the rejection of claims 1-7, 20, 21, 23, 24, 26, & 30 but do not disclose said joints consist of long joints for swiveling and short joints for hinged motion comprising three joint pairs, including a

seventh joint in said measurement probe, wherein said long joints are 90^0 to said short joint in each joint pair arranged in a 2-2-3 arrangement.

Raab discloses a 3D coordinate measuring apparatus with 3 joints pairs in a 2-2-3 arrangement with a seventh joint for the measurement probe, wherein the long joints swivel and the short joints have hinge motion, and the long joints are 90^0 to the short joint (Figure 1). Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention was made to add the joint pairs disclosed by Raab to the arm disclosed by Guertin et al. in order to have more degrees of freedom and range of motion in measurement.

11. Claims 22, 35, & 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guertin et al. in view of Tomelleri (U.S. Patent 4891889).

Guertin et al. discloses all of the instant claimed invention as stated above in the rejection of claims 1-7, 20, 21, 23, 24, 26, & 30 but do not disclose said sensors are proximity sensors.

Tomelleri discloses an apparatus for measuring the position and orientation of areas in structures with proximity sensors (38) in the joints for measuring the displacements of said joints in order that each displacement will be compared to a reference (col. 3 lines 44-53). Therefore, it would have been obvious to one with ordinary skill in the art at the time of the invention was made to add the proximity sensors disclosed by Tomelleri to the sensors disclosed by Guertin et al. in order to measure each displacement of the joints in addition to relative movement of the arm.

Allowable Subject Matter

12. Claims 18 & 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. The following is a statement of reasons for the indication of allowable subject matter:

With reference to claims 18 & 19, the prior art of record does not disclose or clearly suggest a portable coordinate measurement machine wherein relative movement is caused by deformation to said arm, in combination with the remaining limitations in the claims.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Mehnert discloses a process and an apparatus for measuring an angle (U.S. Patent 4449191). Kosugi et al. discloses a headlight optical axis aiming measuring apparatus and method (U.S. Patent 4730923). Chaney discloses a method and apparatus for measurement of angular displacement (U.S. Patent 5237390). Chanoni et al. discloses a unit for continuously measuring shape defects of a part, and measuring process used in this unit (U.S. Patent 5276974). Herzog discloses a coordinate measuring device (U.S. Patent 5396712). Brenner et al. discloses a method and manually guided coordinate measuring apparatus for measuring a workpiece (U.S. Patent 5724745). Best discloses an apparatus for processing small parts utilizing a robot and an array of tools mounted on the outer robot arm (U.S. Patent 5768768). Hofmeister discloses an articulated arm transfer device (U.S. Patent 5899658). Igaki et al. discloses a rotation angle detecting apparatus and its rotary disc (U.S. Patent App. Pub. 2002/0196833). Carlidle discloses a coordinate measuring system (U.S. Patent 6543149). Bieg et al. discloses a highly accurate articulated coordinate measuring machine (U.S. Patent 6668466). Raab discloses a method for programming a computer controlled multi-axis devices (GB 0640902A2).

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Travis M Reis whose telephone number is (571) 272-2249.

The examiner can normally be reached on 8--5 M--F.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on (571) 272-2245. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for all communications.

Travis M Reis
Examiner
Art Unit 2859

Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800

tmr
August 4, 2004


G. BRADLEY BENNETT
PRIMARY EXAMINER
AU 2859